Claims

[c1]   1. A regeneration controller for a water softener comprising:

a water meter configured to output a signal indicative of the volume of influent water received by the water softener;

a water-hardness indicator configured to output a signal indicative of a degree of hardness of the influent water;

a processor coupled to receive the respective signals from the water meter and the water-hardness indicator, the processor being configured to compute a value indicative of the total level of hardness removed by the water softener; and

a comparator coupled to receive a signal indicative of the capacity of the resin in the water softener, the comparator further configured to receive the value indicative of total hardness to issue a regeneration command based on comparing the resin capacity relative to the value of total hardness.

[c2]   2. The regeneration controller of claim 1 wherein the water-hardness indicator comprises a conductivity meter configured to measure a degree of conductivity of the influent water.

[c3]   3. The regeneration controller of claim 2 further comprising memory for storing a functional relationship for relating the degree of conductivity measured by the conductivity meter to a degree of hardness of the influent water.

[c4]   4. The regeneration controller of claim 2 further comprising a look-up table for relating the degree of conductivity measured by the conductivity meter to a degree of hardness of the influent water.

[c5]   5. The regeneration controller of claim 1 wherein the water-hardness indicator comprises an ion-selective electrode configured to measure a degree of calcium ion concentration in the influent water.

[c6]   6. The regeneration controller of claim 5 further comprising memory for storing a functional relationship for relating the degree of calcium ion concentration measured by the ion-selective electrode to a degree of hardness of the influent water.

[c7] 7. The regeneration controller of claim 5 further comprising a look-up table for relating the degree of calcium ion concentration measured by the ion-selective electrode to a degree of hardness of the influent water.

[c8] 8. The regeneration controller of claim 1 wherein the total level of hardness removed by the water softener is calculated based on the product of the volume of influent water by the degree of hardness of the influent water.

[c9] 9. The regeneration controller of claim 1 wherein the comparator is configured to generate the regeneration command when the total level of hardness computed by the processor is equal to the level of resin capacity of the water softener.

[c10] 10. A method for controlling regeneration of a water softener, the method comprising:

measuring the volume of influent water received by the water softener;

measuring a signal indicative of a degree of hardness of the influent water;

calculating a value indicative of the total level of hardness removed by the water softener;

providing the quantity of resin capacity of the water softener; and

relating the quantity of resin capacity to the value of total hardness to determine whether or not regeneration is to be commanded for the water softener.

[c11] 11. The control method of claim 10 wherein the signal indicative of the degree of hardness of the influent water comprises a measurement of a degree of conductivity of the influent water.

[c12] 12. The control method of claim 10 further comprising relating the measured degree of conductivity to a degree of hardness of the influent water.

[c13] 13. The control method of claim 10 wherein the signal indicative of the degree of hardness of the influent water comprises a measurement of calcium concentration in the influent water.

[c14] 14. The control method of claim 13 further comprising relating the measured

degree of calcium concentration to a degree of hardness of the influent water.

[c15]   15.The control method of claim 10 wherein the total level of hardness removed by the water softener is calculated based on multiplying the volume of influent water times the degree of hardness of the influent water.

[c16]   16.The control method of claim 10 wherein the regeneration command is issued when the calculated total level of hardness is equal to the resin capacity of the water softener.